

Agrifood Systems Policy Research

AGRICULTURAL GROWTH,
HUNGER, AND POVERTY -
HISTORICAL EVOLUTION
OF AGRIFOOD SYSTEMS IN
PAKISTAN

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ABOUT THIS NOTE

This study probes assumptions which underpin current thinking about the transformation of Pakistan's agrifood systems by identifying and examining key turning points from the 1840s onwards in sub-regions of the Indus irrigated plains. It highlights historical antecedents of contemporary agrifood systems including: the political-strategic goals of colonial reformers, origins of inter-regional disparities, the elevation and marginalisation of various social groups and agrarian classes, ambivalence towards markets and market-players, and the entrenched political economy of land and water resources.

KEY STUDY FINDINGS

1. Pakistan has made slow progress in reducing hunger and rural poverty despite a relatively productive agricultural sector
2. There are important disconnects between agricultural performance and social objectives like the eradication of hunger and reduction in rural poverty, and many of these are rooted in historically-inherited patterns of regional and social inequality
3. Some of the high performing regions have been on the political and developmental periphery, and also account for a high burden of hunger and rural poverty
4. The colonial land and irrigation systems administration created formal division of the rural community in Punjab into 'agricultural' and 'non-agricultural' tribes/castes, elevating the former and marginalising the latter:
 - a) Colonial land administration systems vested land ownership in former intermediary classes of revenue farmers, relegating actual tillers to the position of tenants and laborers
 - b) Large-scale canal-based irrigation systems turned existing tribal chiefs and waterlords into rentiers, dispossessed pastoral communities with traditional usufruct, and organized largescale migration of village communities to the peripheries

5. Post-independence reforms did not radically break from the trajectory of the colonial period
6. The Green Revolution achieved significant improvements in harvests and yields through the application of inputs but not overall productivity - its main drivers were exhausted by the 1990s
7. With the exhaustion of drivers of past growth, change in agrifood systems will need to address more fundamental issues:
 - a) Peripheral sub-regions need to be seen as central stakeholders - devolution of powers to provinces and broad acceptance of devolution of authority within Punjab makes this an opportune time for such a change
 - b) Recognition of landless and landpoor agricultural labourers as key stakeholders in agrifood systems
 - c) Need for major reforms in the irrigation system

INTRODUCTION

Agriculture accounts for a fifth of Pakistan's GDP and employs approximately 37% of the workforce [1]. The country is mostly self-sufficient in its main staple crop (wheat), has a large livestock sector, exports rice, and produces cash crops, such as sugarcane and cotton, as well as a variety of vegetables and fruits. Yet, in terms of most indicators of food security and nutrition, such as caloric intake, dietary diversity, household experience of or vulnerability to food insecurity, and child stunting and wasting, the country has registered slow progress. Although the national headcount ratio of income poverty has steadily declined, deep pockets of hunger and poverty remain across the country, not only in regions with low agricultural productivity, but also in some regions that are considered part of the agricultural heartland.

'Underperforming' Agriculture and Food Security

The annual average growth rate in agricultural output has remained at approximately 2.7% over the last two decades, while the annual population

growth rate has been just under 2% during the same period [2]. However, the agricultural growth rate has comparatively been on the decline from historically higher rates in preceding decades – 5.4% and 4.4% in the 1980s and 1990s, respectively. This has been a cause of concern vis-à-vis economic growth, particularly in the context of rural poverty reduction (Spielman et al. 2017). A comparison over time also suggests that the country's agricultural sector is underperforming and that there is potential to achieve higher growth rates [3]. It has been argued that agricultural growth can be accelerated through a range of policy measures such as promoting research on new seed varieties, investing in water and soil sustainability, reforming the governance of markets and irrigation systems, advocating for a shift toward higher value crops and products, and improving the efficiency of value chains (see MNFSR 2018; GoS 2018; Secretary Agriculture, Government of Punjab 2018; Rana et al. 2021; Miller et al. 2021; Spielman et al. 2017; Davies and Young 2021).

Meanwhile, the relationship between agrifood systems and hunger and poverty in Pakistan remains relatively unexamined. Most studies on food security focus on the aggregate availability of food at the national or subnational levels (e.g., Ahmad and Farooq 2010; Hussain and Routray 2012; Kamal et al. 2022 ; Mahmood et al. 2016; Nouman et al. 2021). Analyses of household-level data find that land ownership (e.g., Munawar et al. 2021 ; Ishfaq et al. 2022; Akbar et al. 2020) and access to regular and secure salaried employment outside of agriculture (e.g., Bashir et al. 2012; Akbar et al. 2020) significantly correlates to food security.

A few studies have investigated or measured the impact pathways through which agricultural productivity, output, and growth might translate into nutrition and food security outcomes for households as well as individuals (see Balagamwala and Gazdar 2013a). Several disconnects have been identified in this regard. In Pakistan, access to land is highly unequal, and an increasing proportion of rural households rely on agricultural labor for their livelihoods. For example, Malik et al. (2016) report that, as per the 2010 Pakistan Rural Households Survey, even though over three-fifths of the sample households did not own agricultural land, agriculture accounted for three-quarters of the average household income (56% from crops and 18% from livestock). Women make up over half the agricultural workforce and are engaged in either low-paid but critical farm activities, such as cash crop harvesting, or unpaid family labor. Sharing the benefits of agricultural growth is thus mediated by pre-existing unequal

economic and social relations. Further, growth in agricultural productivity does not significantly contribute to lowering food prices either, as they are increasingly linked to world prices (Balagamwala and Gazdar 2013).

The significant prevalence of hunger and poverty in subregions within Pakistan's irrigated agricultural heartland are an indication of the weak linkages between agriculture and food security. There is a need, therefore, for more detailed research on individual- and household-level linkages between agriculture and food security. Further, a focus on regions and subregions would offer analytical insights as well as strategic entry points for policy. Being a large country with diverse topographic and agro-climatic conditions, Pakistan consists of not one but several agrifood systems. It is also a federal state where a range of mandates in the social sectors are vested with the provincial governments. Provinces represent historical continuity with respect to institutional and economic development, and provincial boundaries also roughly coincide with distinctive agricultural zones.

Policy Opportunities

Agriculture was fully devolved to the provinces in 2010 through an important constitutional amendment that expanded the powers of provincial governments (Spielman et al. 2017) [4]. Although the federal government retained the Ministry for National Food Security and Research (MNFSR) and the National Social Protection Program, provincial governments are responsible for most matters relating to food security and nutrition.

One outcome of the changed policy dynamics is the preparation and, in some cases, approval of provincial policies on agriculture in line with the National Food Security Policy (MNFSR 2018) [5].

This paper offers a historical view of the agrifood system of the irrigated Indus floodplains with a special focus on southern Punjab and Sindh – two relatively productive agricultural subregions with a high burden of hunger and poverty. A historical perspective suggests that the existing features of agrifood systems – including the productivity of agricultural resources, access to these resources, patterns of social inclusion and exclusion, cropping systems and technologies, and markets for labor, inputs, and produce – are rooted in past circumstances and choices. Understanding the historical antecedents of contemporary agrifood systems can complement policy analysis in several ways. It can help in reviewing and differentiating between structural and proximate drivers of change. Besides, it can also help in identifying potential areas and stakeholders for change previously overlooked as a result of certain political and policy choices made by the country in the past.

The period of historical review starts from the 1840s, coinciding with the establishment of the British colonial government over the territory that is currently Pakistan's provinces, particularly the Indus plains. As elsewhere in South Asia, the onset of colonial rule in Pakistan was associated with historic changes in agrifood systems. Significant

milestones include the institution of land revenue settlements (1860s), the initiation of irrigation works (1880s), the Punjab Alienation of Land Act (1901), independence and the partition of Punjab (1947) between India and Pakistan, successive post-independence attempts at land reform (1950s to 1970s), and the introduction of new seeds and technologies or the so-called green revolution (1960s onward).

DATA, SOURCES, AND METHODS

This paper draws on secondary data and literature from diverse sources. The analysis of current conditions across the provinces and subregions with respect to agrifood systems, hunger, and poverty relies mostly on publicly available data, most of which have been generated or compiled by the government, primarily the Pakistan Bureau of Statistics (PBS). These include the most recent population Census (2017) as well as previous ones relating to the period before and after independence (1947) to illustrate the historical context of post-colonial policies and development. The Agricultural Census 2020 was used to gather useful data on land utilization, irrigation, the distribution of land ownership, and tenancy. Data on the area, output, and yield of various crops, as well as information on the total cropped area, were compiled using comparable time series available from official sources such as provincial agriculture departments. The main sources of information for hunger and poverty statistics across provinces and regions were the Household Integrated Economic Survey (HIES) of the PBS

and the Multidimensional Poverty Index constructed by the Oxford Poverty and Human Development Index (OPHI) using HIES data and validated by the Government of Pakistan (OPHI and UNDP Pakistan 2016).

All data sources used in this paper are either district-level aggregates or based on samples that were designed to be statistically representative of the district level. In addition to published provincial-level data, comparative statistics for sub-provincial regions have been computed (e.g., South Punjab and 'the rest of Punjab'; Karachi and 'the rest of Sindh') based on district-level data.

Several sources of geospatial data have been used in this paper to prepare maps (Figures 1 to 5) on the topography, rivers, canal command area, and agro-climatic zones of the provinces and relevant sub-provincial regions. Care has been taken to utilize published maps. All the maps prepared for this paper include the juxtaposition of provincial and sub-provincial boundaries on various natural and agro-climatic features. In one case (Figure 3), multiple province-level images have been merged to create an integrated map of the canal command area of the Indus-irrigated plains.

Secondary material relating to various sections in this paper was identified and reviewed using different approaches. The three-volume study of *The Land Systems of British India* by Baden-Powell (1892) is widely regarded as a key documentary source on agrarian conditions across provinces and subregions before and after the

British takeover. The chapter on Sindh is of particular value due to its detailed discussion of the precolonial system. Historical studies of certain regions – such as Roseberry III (1988) on Multan and Gilmartin (2015) on Dera Ghazi Khan – offer detailed insights into precolonial conditions.

This paper also relied on the general political histories of some of the regions. Imran Ali's 1989 study of the development of irrigation systems in Punjab remains one of the most thoroughly researched works on the history of canal colonization. Gazettes from various southern Punjab districts have been used to gather supplementary information on precolonial land and irrigation systems. The political and economic antecedents to the Punjab Alienation of Land Act drew the attention of a number of scholars, contemporary colonial administrators, as well as latter-day historians. This literature was also searched manually, with additional queries on Google Scholar using the keywords 'Punjab land alienation.' Post-independence land reforms were studied using original documents reproduced in Naqvi et al. (1987).

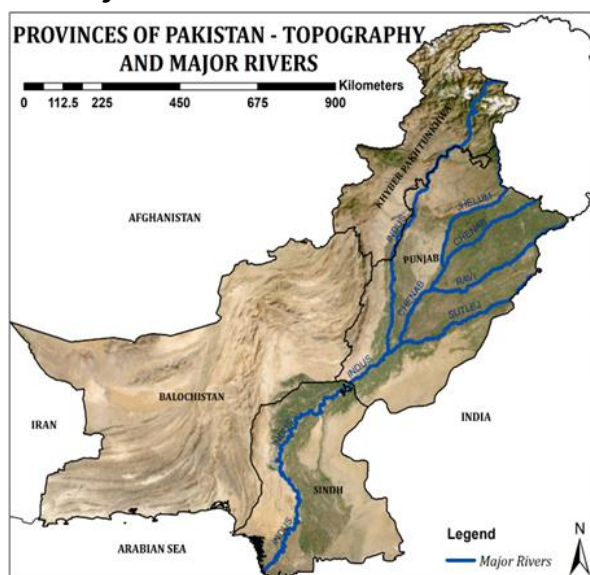
Google Scholar was searched using keywords such as 'agriculture food security Pakistan,' 'agriculture growth Pakistan,' 'irrigation Pakistan,' and 'green revolution.' Identified references were supplemented through manual searches of key stakeholder organizations. Current policy documents were obtained from the official web pages of relevant organizations.

RESOURCES, HUNGER, AND POVERTY ACROSS REGIONS

Land and Water Resources

The federal state structure in Pakistan consists of four provinces – Balochistan, Khyber Pakhtunkhwa, Punjab, and Sindh – and Islamabad Capital Territory [6]. The country's population is concentrated in the floodplains of the Indus River basin, which is a system of rivers that flows from the Himalayan and Karakoram ranges in the north and the Hindu Kush and Sulaiman ranges in the west (in the Khyber Pakhtunkhwa and Balochistan provinces) and is bound by the Thar Desert to its east. The Indus receives flows from its tributaries along its course, with the major rivers of Punjab (Sutlej, Ravi, Chenab, and Jhelum) joining the main stem in the southern part of the province, from where it runs along the middle of the Sindh province and into the Arabian Sea (Figure 1).

FIGURE 1. Provinces of Pakistan: Topography and major rivers



Source: Service Layer Credits: Esri, Maxar, Earthstar Geographics, and the GIS user community. Source: OCHA FISS 2023; Survey of Pakistan Ministry of Defence (<http://www.surveyofpakistan.gov.pk/Detail/MTUzYWU5ZGIhNTA4NS00MDkLWFODctNTRkY2JmNWlOMjg2>)

Provinces vary greatly in terms of population and resources (Table 1). For instance, Balochistan makes up over two-fifths of the land area and accounts for 5% of the population. Less than a tenth of Balochistan is classified as farmland, of which less than half is cultivated. In contrast, Punjab is the most populous province, accounting for more than half of the national population. It occupies a quarter of the total area of the four provinces (26%), more than half of all farmlands, and nearly two-thirds of the country's total cultivated area is in Punjab. There are significant agricultural subregions within each province. Partly in recognition of administrative expedients and partly in response to the political demand for a separate province, the Punjab provincial government has initiated the process of establishing a separate secretariat for South Punjab, which includes the three southern divisions of Bahawalpur, Dera Ghazi Khan, and Multan and 11 districts [7]. This move may be a possible precursor to the creation of a South Punjab province (Figure 2) (Gabol 2021).

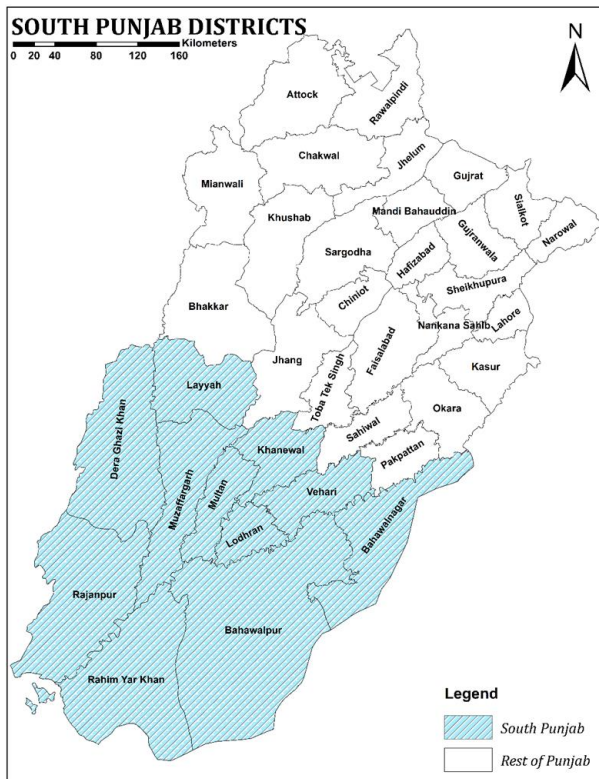
TABLE 1: Population and land utilization by province

	Population (million, 2017) ^a	Area (million hectares, 2020)		
		All land	Farmland	Cultivated land
Balochistan	12	34.7	3.3	1.4
Khyber Pakhtunkhwa	31	10.1	2.3	1.8
Punjab	110	20.6	11.9	10.9
Sindh	48	14.1	4.0	3.1
Total	205	79.6	21.4	17.2

Sources: PBS 2017, 2020.

Notes: a The provincial total excludes the population (2 million) of Islamabad Capital Territory.

FIGURE 2. South Punjab districts



Source: OCHA FISS 2023

Irrigation is a defining feature of Pakistan's agrifood systems. Four-fifths of the cultivated area of the four provinces combined is irrigated, of which 85% is irrigated wholly or partly by government canals (Table 2) [8].

TABLE 2: Irrigation by province

	Proportion of cultivated area (%) 2020					Canal withdrawal ^b
	All irrigated	Canal ^a	Canal/tube well	Non-canal sources	Un-irrigated	
Balochistan	64.3	21.4	2.1	40.7	35.7	3
Khyber Pakhtunkhwa	55.6	27.8	2.8	25.0	44.4	8
Punjab	82.6	15.6	47.7	19.3	17.4	50
Sindh	93.5	80.6	9.7	3.2	6.5	43
Total	80.4	28.0	39.7	12.6	19.6	104

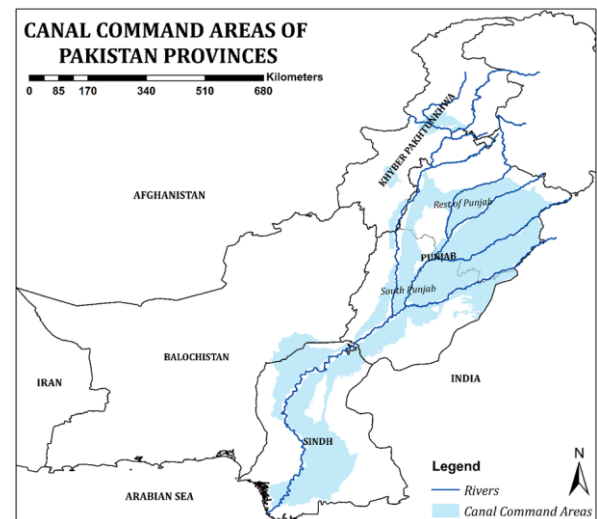
Sources: PBS 2020, Pakistan Bureau of Statistics, Government of Pakistan, based on Water Management Directorate, Water and Power Development Authority (WAPDA) https://www.pbs.gov.pk/sites/default/files/tables/agriculture_statistics/table_7_province_wise_canal_withdrawals.pdf. Accessed 9 March 2023.

Notes: **a** Nearly all the canal- and canal/tube well-irrigated areas are served by government canals. Private canals account for 0.26 and 0.07 mha in Khyber Pakhtunkhwa and Balochistan, respectively.

b Average of (2011–2020) in million-acre feet

Approximately 7 million hectares (mha) in Punjab, 2.8 mha in Sindh, and less than 1 mha in the two western provinces of Balochistan and Khyber Pakhtunkhwa (combined) receive water from the canals. The western provinces also account for just a tenth of canal withdrawals. Crop farming in Sindh relies almost entirely on canal water, while Punjab uses a mix of canal and groundwater (Table 2). The command area of the canal system of the Indus River basin constitutes Pakistan's agricultural heartland, which falls almost entirely in the provinces of Punjab and Sindh (Figure 3).

FIGURE 3. Canal command areas of Pakistan

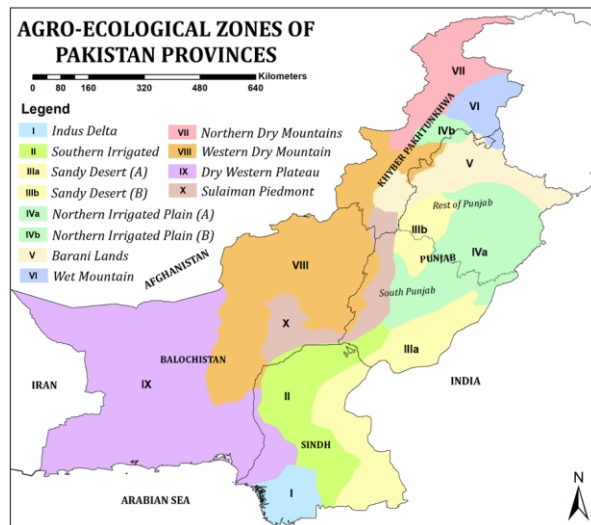


Source: OCHA FISS 2023; Survey of Pakistan Ministry of Defence (<http://www.surveyofpakistan.gov.pk/Detail/MTUzYWU5ZGItNTA4NS00MDkLWF0DctNTRkY2JmNW10Mjg2>), IRSA n.d.a, n.d.b, n.d.c, n.d.d. Notes: Balochistan polygon has been drawn from Google Earth.

The non-canal irrigated regions of Pakistan include much of Balochistan and Khyber Pakhtunkhwa, the Pothwar Plateau in northern Punjab (region V in Figure 4), the Thal Desert in western Punjab (region IIIb in Figure 4), uplands on the right bank of the Indus in Punjab and Sindh, and the Thar desert straddling the eastern part of (South) Punjab and Sindh (region IIIa in Figure 4).

These regions consist of multiple agrifood systems that rely on rainfall and/or groundwater resources and comprise dry and wet mountains as well as large expanses of arid and semi-arid deserts. The stark difference between the irrigated Indus plains (regions II, IVa, and IVb in Figure 4) and the rest of Pakistan's provinces is evident in any analysis of the country's agrifood systems.

FIGURE 4. Agro-ecological zones of the provinces in Pakistan

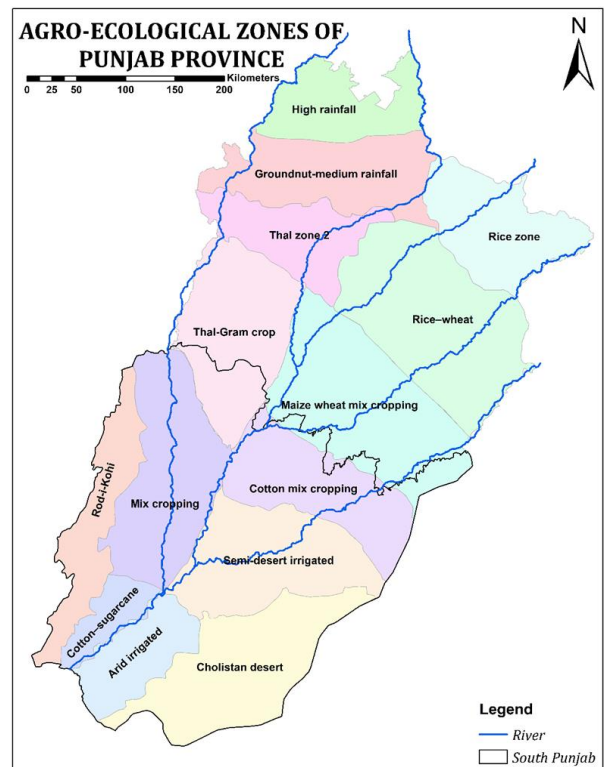


Sources: OCHA FISS 2023; Survey of Pakistan Ministry of Defence (<http://www.surveyofpakistan.gov.pk/Detail/MTUzYWU5ZGltNTA4NS00MDkLWF0lODctNTRkYzJmNW10Mjg2>); Rahim et al. 2011.

The agrifood system of the Indus-irrigated plains straddles several cropping zones (Figures 4 and 5), with different soil and climatic conditions across the four provinces. Yet, it is possible to view these diverse zones as one agrifood system or describe them as one overarching system that includes several similar subsystems. The main feature of this system is its reliance on canal irrigation. Therefore, much of this system has sufficient water supply during the two major cropping seasons – winter (*Rabi*) and summer (*Kharif*). Wheat is commonly grown in the *Rabi* season across the irrigated plains, with subregional variations during *Kharif*, when rice and

cotton are primarily grown. There are also significant areas within this system that are dedicated to multi-year perennial crops, such as sugarcane and banana, fruit orchards, and vegetable farming. Livestock rearing is an important activity for farmers and non-farmers, but the area under dedicated fodder crops is usually less than a tenth of the gross cropped area in a year. Much of the fodder is derived from weeding and other waste products of food and cash crops.

FIGURE 5. Agro-ecological zones of Punjab.



Source: Ahmad et al. 2019

An important characteristic of the irrigated plains is the virtual 'zoning' of vast tracts of land for unique crops. Part of this zonal specialization is historical. For example, the installation of sugar mills in the 1960s was accompanied by the mandatory planting of sugarcane in surrounding areas. These zones also feature favorable local agro-climatic conditions for cultivating these unique crops.

This zoning is partly attributable to the existence of integrated gradient-based irrigation systems. While these systems allow small farms located along a water channel to benefit from scale economies with respect to irrigation, they also make it difficult for individual farms located along the same watercourse to operate independently.

The agrifood system of the irrigated plains is also characterized by a high degree of market penetration for inputs and outputs. There are active markets for the rental of farm machinery and aggressive marketing of inputs such as fertilizers and pesticides by the private sector. While the government is an important price-setter for the wheat crop – typically procuring up to a fifth of the total harvest – private sector traders are also equally important players in all crops, including wheat.

TABLE 3. Output and regional shares of major crops: Five-year average (2017–2018 to 2021–2022)

	Wheat	Rice	Cotton	Sugarcane
Average annual output of Pakistan (1000 tons)	25,708	7,920	1,576	77,068
Region's share in national output (%)				
Balochistan	4	7	1	0
Khyber Pakhtunkhwa	5	2	0	7
Punjab	76	58	68	69
South Punjab	34	8	62	35
Rest of Punjab	42	51	6	34
Sindh	15	33	31	24

Source: Author's calculations based on data series from Agricultural Marketing Information Service, Directorate of Agriculture, Lahore.

Over 90% of wheat and rice produced in the four provinces are grown in Punjab and Sindh (Table 3). These provinces also account for virtually all the cotton and sugarcane produced in the country. Over three-fifths of all cotton produced in Pakistan is grown in South Punjab, while Sindh accounts

for one-third of the produce. Cotton is arguably the most important cash crop for the national economy, as it sustains the country's largest export sector. Crop yields for wheat, cotton, and sugarcane are also among the highest in Sindh and South Punjab compared to other agricultural regions (Table 4).

TABLE 4. Yield of major crops: Five-year average (2017–2018 to 2021–2022) (tons per hectare)

Region	Wheat	Rice	Cotton	Sugarcane
Pakistan	2.9	2.5	0.68	65.9
Balochistan	2.3	3.2	0.44	40.6
Khyber Pakhtunkhwa	1.8	2.4	0.49	65.4
Punjab	3.0	2.1	0.62	68.4
South Punjab	3.3	2.0	0.63	74.1
Rest of Punjab	2.8	2.2	0.59	63.4
Sindh	3.4	3.5	0.89	62.5

Source: Author's calculations based on data series from Agricultural Marketing Information Service, Directorate of Agriculture, Lahore.

The agrifood systems in Pakistan's non-canal irrigated regions, which include much of Balochistan and Khyber Pakhtunkhwa, as well as the northern plateau of Punjab, the piedmont and highlights along the right bank of the Indus in Punjab and Sindh, and the eastern Thar desert in the latter two provinces, stand in complete contrast to those in the canal-irrigated plains. Seasonal water availability is a major concern for these regions. As a result of uncertain water availability, many of these regions grow a range of drought-resistant crops. Due to the high probability of harvest failure, there is a tendency in these regions not to invest in fertilizer-responsive varieties and corresponding inputs. Therefore, many of the non-canal subregions in Balochistan and Khyber Pakhtunkhwa grow high-value fruit using groundwater.

Hunger and Poverty Across Provinces and Subregions

According to the 2017 population census, Pakistan's population is estimated to be approximately 207 million [9]. Nearly two-thirds of the national population is rural (Table 5). Punjab accounts for over half the national population, followed by Sindh (23%), Khyber Pakhtunkhwa (17%), Balochistan (5%), and Islamabad (1%). Sindh is the most urbanized province, with over half its population being counted as urban. This high rate of urbanization can be attributed to the demographic profile of Karachi, Sindh's capital city, which is also the country's largest metropolis. However, if the population of Sindh is tabulated without including Karachi, then more than two-thirds of Sindh would be rural. This figure is comparable to the rural population of Punjab taken as a whole (63%). The difference between South Punjab and the rest of Punjab is also equally stark. South Punjab, accounting for 17% of the national population, is 76% rural. On the other hand, the rest of Punjab has a third of the national population, yet approximately 44% of its population lives in urban areas. Khyber Pakhtunkhwa is the most rural province (over 80%), followed by Balochistan (71%), though less so than South Punjab.

Regional and Subregional Comparisons

Approximately a sixth (16.5%) of all households in a district representative sample survey (PBS 2020) reported that they had experienced moderate or severe food insecurity over a reference period preceding the survey (Table 5). This is quite high for a country that is thought to be self-sufficient in its main staple crop and is a global exporter of agricultural produce.

TABLE 5. Population, hunger, poverty, and food output by subregion

	Proportion of national population (%)	Rural population (%)	Moderate or severe food insecurity (%)	Poverty headcount ratio (%)	Per capita food grains output (kg)
<i>Variable and data source</i>	Population census (2017)	Population census (2017)	Food insecurity experience scale from PSLM ^a (2019–2020)	Multidimensional Poverty Index (2014–2015)	Wheat and rice 5-year average (2017–2018 to 20121–2022)
Pakistan	100.0	63.4	16.5	37.8	134
Balochistan	5.4	71.0	22.7	61.8	100
Khyber Pakhtunkhwa	17.0	83.3	15.2	48.3	34
Punjab	53.4	63.1	15.6	30.9	187
<i>South Punjab</i>	16.9	76.6	21.0	51.2	209
<i>Rest of Punjab</i>	36.5	56.9	13.2	21.5	175
Sindh	23.2	48.1	18.2	42.2	104
<i>Karachi</i>	7.8	7.1	9.6	4.5	0
<i>Rest of Sindh</i>	15.4	68.7	22.3	61.3	157
Islamabad	1.0	49.6	7.9	3.1	11

Notes: ^a PSLM: Pakistan Social and Living Standard Measurement Survey.

Provincial and sub-provincial differences in exposure to food insecurity are instructive. For instance, Islamabad and Khyber Pakhtunkhwa have the lowest levels of food insecurity despite also having the lowest per capita food grain output among all the federal units. Balochistan has the highest rate of food insecurity with a fifth of the households reported as being either moderately or severely food insecure. In Punjab and Sindh regional contrasts are important. South Punjab and Sindh excluding Karachi, both subregions with high per capita rates of grain output, have rates of food insecurity that are similar to Balochistan. Provincial and subregional rankings with respect to the headcount of multidimensional poverty also reveal a similar pattern – Balochistan, South Punjab, and Sindh, excluding Karachi, stand out as regions of high poverty [10].

The provincial and subregional hunger and poverty rankings based on indicators of urbanization and food grain output raise many critical questions about the linkages between agrifood systems and food security. Of the three regions and subregions that stand out in terms of hunger and poverty – Balochistan, South Punjab, and Sindh excluding Karachi – Punjab and Sindh are part of the Indus-irrigated plains and are relatively more productive subregions within that agrifood system. Balochistan is the only region that testifies to the purported link between poor agrifood system resources and social outcomes. The more urbanized subregions – Islamabad, Karachi, and Punjab, excluding South Punjab – are among the least poor and food insecure.

Interestingly, Khyber Pakhtunkhwa is highly rural, relatively poorly endowed with agricultural resources, and yet performs better than its other rural counterparts in terms of hunger.

These regional and subregional rankings indicate that national and even provincial-level statistics may conceal deep and persistent pockets of hunger and poverty. Further, they suggest that non-agricultural economic activity, such as high rates of urbanization in the cases of Islamabad, Karachi, and Punjab excluding South Punjab, and migrant remittances in the case of Khyber Pakhtunkhwa, might be a major contributor to lower levels of hunger and poverty in some regions.

However, key questions about the pathways and disconnects between agrifood systems and hunger and poverty reduction, or eradication, remain. The fact that agricultural

regions such as South Punjab and Sindh contribute significantly to the national economy through the production and export of crops and fruit and yet continue to struggle with hunger and poverty implies that ‘agricultural underperformance’ in terms of growth rates is not the only problem that needs to be addressed. Measures for improving agricultural growth need to be examined more critically if they are to lead to different outcomes for these key subregions of the Indus-irrigated plains.

Inequality in Access to Land

Inequality is an obvious explanation for the coexistence of a relatively productive agricultural sector and enduring hunger and poverty (Table 6). Less than half of all rural households own all the agricultural land in Pakistan. This skewed ratio between land ownership and population is the lowest in Sindh, where less than a quarter of the rural households own most of the land. Land ownership is also concentrated in large holdings. A fifth of all privately owned land is in holdings exceeding 100 acres. The percentage of large holdings is very high in the sparsely populated and semi-arid Balochistan. It is also high in Sindh and higher in South Punjab compared with the rest of Punjab. A majority of rural households do not operate the land as farmers. Rather, they rely on various forms of agricultural work as laborers for their livelihoods. In Sindh, where rural landlessness is very high, around a quarter of the farms are operated by landless tenants. However, in South Punjab, even tenancy is no longer a path for accessing land.

TABLE 6: Agricultural land ownership, concentration, and access

	Rural households owning land (%)	Proportion of land in ownership holdings exceeding 100 acres (%)	Rural households operating land (%)	Tenant farms as proportion of all farms (%)
Pakistan	43.87	19.9	43.39	11.1
Balochistan	30.06	62.8	32.28	14.0
Khyber Pakhtunkhwa	51.54	10.1	49.60	6.9
Punjab	50.44	8.7	48.51	9.0
<i>South Punjab</i>	48.09	11.9	47.73	5.8
<i>Rest of Punjab</i>	51.81	6.9	48.96	10.8
Sindh	24.04	15.3	27.87	25.7

Source: The author's calculations are based on data from the Agricultural Census (2010) and the Population Census (PBS 2017).

Framing Historical Vantage Points

The next few sections of this paper identify the major historical turning points that shaped agrifood systems in the Indus floodplains, with a particular focus on South Punjab and Sindh. They attempt to put together a probable narrative of the prevailing features of agrifood systems by recounting episodes of institutional and technological change. If persistent inequality in the ownership of or access to agricultural resources, such as land and irrigation, is one possible explanation for the disconnect between agrifood systems and hunger and poverty eradication, it is crucial to look at key historical moments as vantage points for learning about change and continuity in the country. The establishment of private property rights in the Indus plains with the onset of British colonial rule was one such moment. The development of the agricultural resource base of the Indus plains – through the construction of a canal irrigation system – was another key moment.

Yet another decisive moment was the colonial state's response to the political

fallout from its own preferred system of property rights. These moments cannot be seen as discrete one-off events. Rather, they provide analytical vantage points into the continuum of economic, social, and political trends that persist to the present day. National independence from a colonial government marks yet another vantage point – a time of political opportunity for altering institutions as well as the distribution of agricultural resources. A final historical moment is the 'green revolution,' which catalyzed the further transformation of the Indus-irrigated agrifood system to something that became even more closely integrated with markets due to the adoption of industrially produced inputs.

COLONIZATION AND LAND REVENUE SETTLEMENT

Colonial Rule and Private Property

Pakistan is comprised of territories that came under direct British colonial rule in the mid-nineteenth century – some 250 years after the foundation of the East India Company, which began the colonization of India from trading stations on the subcontinent's coast. Sindh was invaded by Company troops from the Bombay Presidency in 1843 and was annexed to that presidency. It became a separate province in 1936. All parts of present-day Punjab had been brought under colonial rule by 1849 through the territorial expansion of the writ of the British Government of India westwards from the Bengal Presidency. Present-day Khyber Pakhtunkhwa was a part of the Punjab province until 1901, and Balochistan was brought under the domain of the British Indian Empire because of the inroads made through tribal regions on the southwestern boundary of Punjab [11].

Punjab was governed as a province of British India rather than a territory of a particular presidency. The institutional history of the Bengal Presidency and the regions brought under British India through it had some influence over the administrative development of Punjab (Baden-Powell 1892).

The expansion of British colonial rule followed a familiar trajectory. Once political sovereignty was established – almost invariably through military conquest – attention would quickly turn to economic resources, notably land and agriculture. The ‘settlement’ of land revenue – or the promulgation and implementation of a system for assigning the liability of taxation on agricultural produce – formed the bedrock of governance [12].

At one stroke, the land revenue settlement paved the way for private property rights in land (which were assigned to particular groups, classes, families, and individuals) and set up a system of administration that connected the now propertied class with the government. These remarkable institutional developments traversed two broad objectives – fiscal sustainability and political stability.

Late Acquisitions of the Empire

The ‘lateness’ of the incorporation of Punjab and Sindh into colonial rule shaped the context within which the land settlements were instituted. The colonial government was predisposed toward extending the version of the land revenue system that already prevailed in the territories that had been used as springboards for the expansion. The *zamindari* system of revenue farming (permanent settlement), which was established during the first phase of the Bengal Presidency, had already become discredited in the eyes of the colonial

government. Comparatively, direct settlement with cultivators (*ryotwari*) in place of revenue farmers or intermediaries was thought to have been successful in the Madras and Bombay presidencies. On the western boundary of the Bengal Presidency – notably in the north-western provinces corresponding to present-day Uttar Pradesh, except for Awadh (present-day Lucknow and Faizabad divisions) – a village-based or *mahalswari* system had been introduced. This system elevated the role of the village-based community of cultivators – in place of the revenue farming system of the *zamindari* permanent settlements and the individual cultivators of the *ryotwari* settlements – as the primary unit of land taxation and, by extension, of private property rights to land. The idea that Punjab mostly consisted of villages that were jointly owned by families belonging to landholder and/or cultivator castes was cited as the basis for this historic choice. Subsequent policies relating not only to land and agriculture but also to administration and politics were to presume and bolster this vision of village-based communities. British colonial administrators’ understanding of the society in Punjab also hinged on the historical significance of a ‘tribal system’ (Gilmartin 1988). This, combined with the preeminence of a village-based community, played a key role in taxation, property rights, governance, and agrifood systems.

From a tax collection point of view, the *zamindari* system had clear advantages. Revenue farmers were made liable to collect revenues from entire villages. Failure to meet revenue demands could lead to forfeiture of the *zamindari*. The government had little or no direct involvement in the management of revenue extraction.

The *zamindars* often subcontracted rent extraction to intermediaries and had recourse to the coercive apparatus of the state in their dealings with cultivators. Zamindar rents and government revenues were assured, with little or no incentive for either party to invest in increasing output.

At the other end of the spectrum, the *ryotwari* system claimed to vest revenue liability with the actual cultivators of the soil. It ensured higher revenues and the possibility of raising tax rates but also required a far more elaborate administrative structure. The *ryotwari* system also had the complex and potentially contentious prerequisite of reliably identifying actual cultivators from among a host of claimants to agricultural produce.

Mahalwari was, in some ways, an intermediate solution. Revenue liability was assigned to the joint body of a village community, and the government appointed a *lambardar* from among the known owners of the village as its recognized nominee.

The precolonial land revenue system in the central region of Punjab depended on *chaudhuris* – men from locally dominant landholding tribes and castes – with influence over several villages. These *chaudhuris* were recognized as revenue agents for the government and received concessions or shares of revenue in return for their service and political loyalty. The *chaudhuri* system of central Punjab was seen as an outcome of the ‘leveling’ influence of the Mughal and Sikh rule in the region, where tribes and tribal leadership structures were made subservient to the government (Gilmartin 1988). There were clear differences in this regard within the subregions of Punjab, particularly in the west (including present-day South

Punjab), where social organization retained political power.

While the *mahalwari* settlement created a direct connection between the government and the village, many of the erstwhile *chaudhuris* were retained under a new title of “*zaildar*” in the colonial land revenue bureaucracy (Gilmartin 1988, Roseberry III 1988). The *zaildari* system, however, could not accommodate the political power of existing tribal chiefs of western Punjab, whose influence was deeper and wider than that of the central Punjab *chaudhuris*. The role of these overlords, similar to their counterparts in Sindh, in organizing and maintaining local canal irrigation systems was recognized yet overlooked in the new system of land management, which was based on private property rights to territory rather than the more complex system of shared entitlements to produce from such territories.

There were other consequences of ‘lateness’ too. As the colonial government’s sources of revenue gradually diversified away from land revenue, the policy focus with respect to land and agriculture began to shift from rent extraction toward economic exploitation. A productive agricultural sector linked with other sectors of the economy was as much a policy concern, or perhaps even more, as the size of land revenue. Following the armed rebellion against British colonial rule in 1857, the government actively sought to create political legitimacy among rural communities. The government needed to engage directly with a broad base of local elites in place of intermediary powerbrokers who had, until then, constituted the political structure of the precolonial state in Punjab.

This new village-based community, with cultivator castes organized into 'brotherhoods,' proved to be an effective framework for political engagement.

Finally, rural Punjab emerged as the favored recruiting ground for the post-1857 British Indian military. The so-called martial races from which men were drawn overlapped almost without exception with cultivator castes, with whom the land revenue was already settled. The peasant-dominated Punjab villages, therefore, metamorphosized overnight into focal points of economic development, the guarantor of political stability, and the key to meeting the security requirements of the imperial state.

Much of what followed in the subsequent development of the agrifood systems of Punjab built upon this political economy model, which emerged in the first two decades of colonial governance in the province.

Periphery of the Periphery

Just as Punjab, located on the north-western periphery of British imperial power in India, was a locus of experiments conducted with respect to land and agriculture elsewhere, there was a core and a periphery within the province, too. The region identified as central Punjab, Lahore, and the districts surrounding it, which was also the seat of political power, was treated as the benchmark with respect to the organization of land, agriculture, and social institutions. It was in this region that the model of a village-based community dominated by cultivator castes was held to be true, and it became the focus of the political economy settlement that ensued from the model. Consequently, the agrarian

and political features of South Punjab and other regions were distinctive from that of central Punjab.

Within South Punjab, there were two separate political entities that enjoyed relative autonomy from Lahore. The first was the state of Bahawalpur in the east, left of the Sutlej. The second was the Multan province in the center; this was broadly the territory on either bank of the Chenab, below its confluence with the Ravi, bounded by the Sutlej in the southeast and the Indus to the west. It was also responsible for the administration of tribal territories on the right bank of the Indus, which consisted of the present-day Dera Ghazi Khan and Rajanpur. Multan, which was never wholly brought under the writ of Ranjit Singh's empire, had been run by a governor who was nominally answerable to Lahore but was mostly left to run his administration without much interference in return for the significant tax revenues transferred to the capital. Bahawalpur was ruled by Muslim Nawabs, who negotiated terms with the British to gain protection from the Sikh empire.

The agrarian economy of South Punjab, as well as other regions of western Punjab, depended on irrigation through wells and canals far more than central Punjab did. Rural communities were settled around wells or along inundation canals that brought river water inland. British colonial administrators who were charged with the settlement of land revenues in the erstwhile Multan province recognized this important difference in the conditions between central Punjab and the South (Roseberry III 1988).

They observed that the village-based community of cultivator castes was not the norm in South Punjab. Rather, a village was likely to be a collection of unrelated castes and tribes who happened to inhabit an area watered by a well. *Peers*, or spiritual leaders, most of them from Syed families claiming descent from Prophet Muhammad (peace be upon him), were accorded an important role in arbitrating matters across tribes and occupied a strategic position in the agrarian political economy of well-irrigated areas. Alternatively, some villages were settled by tribal chiefs who had undertaken the excavation or rehabilitation of canals. In such instances, tribal chiefs were revenue farmers for the province and provided political and military support to the government. Revenue farmers in South Punjab, therefore, were not absentee or disinterested *zamindars*, which is characteristic of the accounts of the eastern region of the Bengal Presidency. Rather, they were active participants, even ‘entrepreneurs,’ in partnership with urban merchants in the construction and maintenance of the irrigation infrastructure essential for the region’s agrarian economy. In this sense, they were also unlike the *chaudhuris* of central Punjab, who leveraged their social influence to obtain political recognition from the government but were not necessarily significant players vis-à-vis investment in the agrarian economy.

While British colonial administrators were aware of the many differences between central Punjab and South Punjab, there is little evidence of any serious debate about establishing a different land revenue system in the region. It was argued that even though South Punjab villages did not correspond to the model of joint

ownership by cultivator caste families, a village-based settlement was still appropriate because it would foster a sense of cooperation and community across diverse holders of the village. The colonial settlement officers were simply citing a pretext for implementing the *mahalwari* system in a region where villages were not reliable units of social organization. Intra-provincial variations in agrarian systems had to be accommodated within the broad framework of *mahalwari*. To this effect, much of South Punjab was subjected to a variant of the *mahalwari* system wherein village revenue liability and, consequently, village ownership was vested with large landlords, tribal chiefs, and families of spiritual leaders (*peers* mostly, though not all, of Syed lineages).

The comparison between Sindh and South Punjab is instructive. The agrarian economy of precolonial Sindh and its rural social structures were not too dissimilar from South Punjab. The Talpurs, who had ruled there for close to a century leading up to the British colonial conquest, had originated from South Punjab. On the other hand, the Abbasi rulers of Bahawalpur claimed to be an offshoot of the Kalhoras, who had reigned Sindh before the Talpurs. Much of the agrarian economy in Sindh also depended on wells and flood canals, which were often excavated by the Baloch tribes under the overlordship of tribal chiefs. As in South Punjab, the chiefs, or *zamindars*, were the revenue agents who were also responsible for the irrigation system. Sindh was invaded by troops from the Bombay Presidency, where the *ryotwari* system prevailed. After much debate, Sindh was deemed appropriate for a *ryotwari* settlement,

and thereafter, *zamindars* were recognized as cultivators (*ryots*) who would ultimately obtain private property rights on the land. The *mahalwari* model was rejected on the same grounds that had been cited with respect to South Punjab – that village-based communities were not the norm in Sindh.

There were two important consequences of the *zamindari* variant of *mahalwari*, which was favored in South Punjab. First, all other cultivators – that is, those who had accepted the overlordship of the *zamindar* as part of an agrarian system in which the chief was responsible for productive investment – were deemed to be tenants. Unlike central Punjab, where cultivators belonging to the dominant community of the village were recognized as being part of the proprietary body of the village, the settlement in South Punjab created local monopolies in favor of tribal chiefs and Syeds. This was similar to the post-settlement scenario in Sindh, where the *zamindars* were assigned effective ownership rights over the land. Second, the revenue village became a register of the assignment of rights to land as well as the social and legal status of castes or tribes more generally. As elsewhere in Punjab, those who were recognized either as owners or tenants – even if they provided agricultural labor – were classified as non-cultivators. This classification was not available in Sindh's variant of *ryotwari* – there was no further formal institutional differentiation of the rural society beyond those who owned land and those who did not.

The formal recognition of the South Punjab and Sindh *zamindars* as village owners and owner-cultivators, respectively, had other important

consequences for the development of the agrarian economy beyond disenfranchising the actual tillers. As the state took on the responsibility of irrigation development and management, the *zamindar's* empowered position as a politically significant landlord made him the main beneficiary of the economic rent that accrued from that investment. It also created opportunities for him to use his power for the active pursuit of rents by influencing the distribution of water resources.

LAND AND WATER RESOURCES

Canal Irrigation

From the 1880s, the British colonial government embarked on a series of irrigation development projects that changed the landscape of the Indus basin [13]. The first canal irrigation projects – Sidhnai and Sohag Para – were located in the Bari Doab, the land between the Ravi and Beas rivers. While Sidhnai was in Multan, Sohag Para was in Montgomery district (present-day Sahiwal), which was a barren tract bordering Multan. In all likelihood, this choice of sites was not incidental. The area was already known for its irrigation works, and incoming British colonial officials were aware of the reputation of the pre-colonial administrations of Sawan Mal and his son, Moolraj, in expanding cultivable area and agricultural output through their support for irrigation works (Roseberry III 1988). The Jamrao Canal project was initiated in Sindh around the same time (Haines 2011). The success of these early canal projects led to the construction of more ambitious infrastructure, which transformed the agrifood system of Punjab and Sindh.

Networks of canals were constructed to carry water from 'headworks' and barrages on rivers to vast tracts of previously uncultivated or partly cultivated land. An integrated irrigation system was created to channel water between rivers and onward to fields. It is estimated that the irrigated area of Punjab increased manifold – from approximately 3 million acres (mac) to 14 mac. Apart from its scale, the new canal system was distinct from existing canals in two ways. First, the new canals were able to provide perennial irrigation by integrating virtually all the river-water resources of the Indus basin into one network. Subsequently, predictable water flows throughout the year created the possibility of large-scale cash cropping.

Second, the infrastructure was constructed and managed entirely by the government. This was in contrast to the former system, which envisaged *zamindars* having an active role and forming partnerships with cultivators and merchants sanctioned by the government [14]. The colonial land revenue settlement had replaced customary rules of usufruct rights to different types of land with a system of property rights which privatized most of the cultivated and cultivatable area to favoured classes who were seen as a reliable political support base of the government. Ancient custom accommodated communal claims to uncultivated land, with rights of usufruct being devolved to chiefs and tribes that investment in land improvement. Under the new system, land that had earlier been deemed 'waste' from a revenue perspective was now declared government property that could be utilized virtually at will.

Political Goals and Preferences

There were several goals behind the development of irrigation infrastructure.

Projects were required to be financially profitable. Since they were financed through bonds, the expected revenue from the project had to cover operational expenses as well as capital costs. Much of the revenue was raised through the levy of water charges on canal-irrigated land. The profitability of a project was, however, only a partial indicator of its economic benefit because revenues from water charges depended not only on increased output but also on the system's efficiency in levying and recovering dues from farmers. This fiscal-focused balance between costs and revenues also disregarded the opportunity cost of resources, such as land and water, which were regarded as freely available by government fiat.

Subject to profitability, the main policy objectives were expressed in welfarist terms, even if the political preferences and motives of the government were easily legible. First, there was alarm in government circles about the 'congestion' in the densely populated districts of central Punjab and the potential for political destabilization. This demographic pressure had to be relieved. A second stated objective was to open former wastelands to efficient agriculturalists in the province. Colonial administrators had already determined, mostly based on casual observation, that the cultivator castes of central Punjab were, indeed, those agriculturalists. A third stated goal was to create model rural communities of enterprising farmers who would also be loyal to the government. The fact that most of the cultivator castes from central Punjab were also a part of the recruitment base for the military added a security dimension to this goal. Other more immediate political objectives became apparent in the way colonization was implemented, with

specific interventions rewarding some individuals and groups while penalizing others.

Colonies and Migration

Migration from central Punjab was an essential feature of canal colonization [15]. In the migrant districts, the focus was to preserve and perpetuate the colonial government's understanding of existing rural social structures. The idea of cultivator caste-led village communities remained central. Potential beneficiaries of land grants were selected by administrative officials in the districts of central Punjab on the basis of their perceived potential as capable farmers [16]. It was expected that these grantees would migrate in groups along with their *kammis* (servants) and laborers from non-agricultural tribes, who would not receive land grants. The impact of this policy was highly disruptive in the host districts.

Canal colonization dispossessed pastoralist communities from erstwhile wastelands brought under irrigation. Existing riverine villages in the host districts were adversely affected by the change in river flows and the creation of new channels and drains, which damaged pre-existing irrigation systems [17]. These communities also lost the customary right to develop their immediate hinterland, as land was taken over for 'canal colonization'. Both the pastoralists and the riverine communities in the host districts eventually received grants of relatively inferior land as part of compensation for their losses.

The government became aware of the destabilizing consequences of its colonization policy early on, as host-district disaffection began to take the shape of protests by the indigenous communities and increasing crime and cattle theft targeting migrants. It is

unclear if the economic grounds for migrant-focused canal colonization were sound or sustainable. In one of the earliest canal colonies in Sindh, Multan, many had applied for land grants from local landlords and eventually received approximately 40% of the allotted area. This was regarded by the government as an acceptable exception in the face of insufficient interest among cultivators in the target districts. Over time, with further concessions by the government and with the establishment of migrant communities in western Punjab, the reluctance toward land grants in the target districts transformed into enthusiasm.

However, by the time the last major colonization project was implemented, the political objectives associated with the early phases of canal development had been diluted. While land grants remained significant, approximately 45% of the total area was allotted through auctions. This attracted the interest of bidders from agricultural as well as non-agricultural tribes, particularly during the later phases of the auction process. Buyers of auctioned land included local landlords as well as migrants who had already established themselves in the area and were keen to expand their holdings.

Agrifood System of Indus-Irrigated Plains

The canal irrigation system ushered a historic change in the agrifood systems of the Indus floodplains. It consolidated the idea of the region, particularly Punjab, primarily as an agricultural economy. Industrial development was seen mostly as an adjunct to agriculture or related to the processing of farm produce such as cotton and fruit. Within agriculture, canal irrigation development elevated crop farming as a central activity.

The privileging of agriculture in general and crop farming, in particular, was in line with the colonial government's understanding of and vision for Punjab as a peasant-dominated rural society. Canal colonization was expected to lead to market-oriented crop farming at a mass scale, turning peasants into market farmers. However, the achievement of this objective varied greatly across the province. While some subregions, such as South Punjab, grew crops for the market from the outset as they had done before the emergence of canal colonies, in other regions, commercial farming developed at a slower pace.

Canal development also led to permanent changes in irrigation systems. Virtually all cropped farming across the floodplains became reliant on an integrated, gradient-based water management system. The main advantages of such a system lay in its ability to expand cultivable areas following improved predictability of perennial water flows. On the downside, the advent of integrated irrigation systems limited the autonomy of farmers who had individual fields; it fused hundreds of acres in a command area into unified cropping zones. Further, these new systems often disrupted natural drainage systems that were utilized in traditional farming, thereby increasing the region's vulnerability to major flooding events. Another significant consequence of the new irrigation system was the establishment of *warabandi* – the rotational allocation of water-flow time slots to landholdings located along a water channel. The local political economy of water allocation – from where to place the water channels to the final operation of the *warabandi* – emerged as a significant factor in the agrifood

systems of the region.

Storing Up Conflict

The experience of South Punjab was distinct from that of other subregions in some ways but quite similar to that of Sindh. Of the major canal colony regions, South Punjab was among the top-performing regions in terms of economic output. It had the highest returns to capital, the greatest expansion in *Kharif* cropping, and, via cotton, among the highest uptakes of cash cropping. It also stood out as a region where local landlords and farmers retained relatively greater stakes in irrigated land compared to other subregions, such as Shahpur (current Sargodha Division) and Lyallpur (current Faisalabad Division), where host communities were mostly marginalized. The ruling elites of South Punjab had enjoyed relative autonomy from central Punjab in the precolonial period, and long periods of effective self-governance were associated with a stronger sense of subregional identity than was the case in Shahpur and Lyallpur. The government policy of favoring central Punjab grantees for canal colonization created the potential for tension between migrant and host communities for control over land and water resources. This factor contributed, in part, to local community demands expressed in cultural terms – the indigenous people of the Seraiki-speaking regions of South Punjab formed a distinctive ethnic group from the people of central Punjab. Likewise, in Sindh, over time, the migration of land grantees from central Punjab was met with hostility from the indigenous communities as well as local elites in ethnic terms (Haines 2011).

The conflict in Sindh intensified before and after Pakistan gained independence in 1947 with the completion of major canal irrigation projects – Sukkur Barrage in 1932, Kotri in 1956, and Guddu in 1962, with a combined command area of 13 mac [18]. The merging of the four (West) Pakistan provinces into a single provincial One Unit from 1955 to 1969 coincided with the period when the newly irrigated lands were being allotted in Sindh. The political demand for the restoration of the old provinces received wide support in Sindh from those demanding the allotment of land to local cultivators. To further exacerbate the situation, complaints over irrigation water shortages in Sindh were directed toward the upper riparian province as the Indus River system faced water budget constraints in the 1980s.

The canal irrigation system established in the 1880s shaped the key features of the contemporary agrifood system of the Indus plains, such as perennial irrigation with predictable water availability, capacity for adopting fertilizer-responsive seeds and the application of modern fertilizers and pesticides, market orientation, and economies of scale along water courses. Other features of canal irrigation that also influenced this agrifood system include the direct involvement of government in the management of the system, the non-recognition of customary rights over wastelands, a system for the virtually unlimited private appropriation of river flows, a gradient-based rotational system of water allocations, and, underlying it all, the creation of virtually chronic allocative disputes all along the system from rivers to water courses.

LAND ALIENATION, DIVISION, AND HIERARCHY

From Private Property to ‘Peasant’ Protection

In the decades following the land revenue settlement in the late nineteenth century, farmer indebtedness and land ‘alienation’ [19] emerged as major concerns among a group of British colonial officials in Punjab. In the *zamindari*-based taxation system of precolonial India, revenue farmers could lose their rights as revenue agents – be ‘alienated’ from their holding – if they failed to meet their fiscal obligations to the government. The detachment of the revenue farmer from the actual cultivator meant that, for the most part, the tiller’s possession of the soil was relatively secure. Under colonial administration, alienation was codified with the establishment of the Court of Wards, which was responsible for taking possession of and auctioning the defaulting estate. Moreover, with the introduction of non-*zamindari* revenue systems of *ryotwari* and *mahalwari*, individual cultivators and village-based communities of cultivators, respectively, were responsible for land revenue. The alienation of debt defaulters, therefore, had a direct impact on actual production. The legal mechanism for auctioning their holdings was extended to cover private creditors (Rothermund 1973) and, in effect, moved the establishment of private property rights to agricultural land further along.

While the privatization of land was a direct and intended consequence of land revenue settlements in British India, there were tensions within the colonial administration between

advocates of the free market and 'champions of peasants' (Van Den Dungen 1966). The phrase 'land alienation,' which implied a transgression, continued to be used for what were, in effect, transactions in the market for land that had been so desired by colonial administrators [20]. In Punjab, the so-called champions of peasants, such as Thorburn (1983), framed farmer debt and the resulting land alienation in religious and class terms. Muslim peasants were deemed to be both profligate and ignorant of market principles, and Hindu moneylenders were portrayed as unscrupulous beneficiaries (Barrier 1965). Protests against the 'loss' of land in various parts of the province were portrayed by the pro-peasant faction of the administration as advocating for urgent remedial measures.

Tribes: Agricultural and Non-Agricultural

The Punjab Alienation of Land Act of 1900 (PALA) was the government's response to this campaign. This law formally classified the society in Punjab into agricultural and non-agricultural tribes and imposed restrictions on the alienation of land from the former to the latter. The economic impact of the PALA is ambiguous. There is evidence that the alienation of land from agricultural to non-agricultural tribes continued to decline sharply. It is not clear, however, if the act led to any significant effect on the availability of credit to farmers. The trope of peasant indebtedness continued to define colonial views on constraints to agricultural growth. Some two decades after the enactment of the law and the exorcising of the rapacious moneylender, Malcolm Darling's widely cited book (1925) was still berating the wastefulness of the still highly indebted Punjab peasant. There had

been little let-up on the demand or supply sides of the credit market. It was thought that the law may have created a secondary market for mortgaging land, with existing landowners stepping in as proxies for moneylenders through benami transactions. There is also evidence of people changing their caste identity to be classified as belonging to 'agricultural tribes' (Cassan 2009).

The elevation of the tribe from being a useful trope for understanding social structures and informing the political strategy of the colonial government to a formal basis for organizing economic resources had far-reaching consequences (Gilmartin 1988).

First, the veracity of the arguments that emphasized the grievances of Muslim peasants arising from the transgressions of Hindu moneylenders' signaled that the government favored the former over the latter. Disagreements over commercial transactions between borrowers and lenders escalated to a political conflict between classes identified along religious lines. At least in South Punjab, this ruptured the precolonial agrarian system that had functioned as a productive partnership between Hindu administrators and merchants on the one hand and cultivators led by Muslim landlords and tribal chiefs on the other. The idea that political mobilization could lead to the large-scale, state-mandated, and group-based renegotiation of property rights – such as the cancellation of debts and mortgages – played some part in the violent communal politics that preceded the partition of Punjab between India and Pakistan and the consequent 'exchange' of populations (Kerr 1989).

When it happened, the partition of Punjab led to the forced migration of millions of people across the newly formed national boundaries. It also led to another round of resource redistribution. Emigrating Hindu moneylenders no longer had the political and social levers required to ensure the viability of the credit they had extended. Benami agreements, through which Muslim agriculturalists held land on behalf of Hindu moneylenders, would also have been defaulted upon. Moreover, land belonging to the Hindus and Sikhs migrating from western Punjab and the Muslims migrating from eastern Punjab was placed under government administration for distribution among migrants against valid claims of property lost on the other side. The acreage of land under government administration was much higher in the western part of Punjab than in the eastern. It is estimated that over 6 mac in Pakistani Punjab were transferred to Muslim migrants from the Indian side (Gazdar 2011).

Formalizing Agrarian Hierarchy

The second consequence of the elevation of the 'Punjab peasant' through the PALA was the corresponding disenfranchisement of the major segment of rural society, who had been classified as non-agricultural. This segment included not just the small number of merchants or urban moneylenders, who were the ostensible targets of the law, but also almost half of the population of the province now placed below cultivators in the social hierarchy, including occupational castes associated with a range of services such as agricultural labor. It also included communities on the margins of settled villages and those living off common property

resources.

While the purpose of the PALA was to regulate land transactions, its implementation required the government to have the ability to distinguish between agricultural and non-agricultural tribes or castes. In other words, it required the listing of castes and their 'agricultural' status. The village-based land revenue system offered a ready basis for a register of castes. It was a formal record of a village community, not only of landholding and use within the boundaries of the village but of all permanent and temporary resident families, their interests in land, and their occupations and castes. This record was adopted as a virtual civil register for a range of administrative purposes, including those unrelated to agriculture. The government school admission form enquired about a pupil's caste, and similarly, an individual's dealings with a police station required her or his caste to be reported. It was mandatory for this information to correspond with the village record. The PALA also required an additional identity marker – whether a family was from an 'agricultural' or 'non-agricultural' tribe. This marker was independent of whether the family-owned land or undertook agricultural work. It was possible for someone not involved in agriculture as an owner, cultivator, or laborer to be recorded as belonging to an 'agricultural' tribe and vice versa.

Since the main purpose of the PALA was to inhibit the sale of land from agricultural to non-agricultural tribes, its exclusionary effect on laboring castes and classes was overlooked. For most of the laborers who were far too impoverished to be able to buy land in any case, the provisions of the PALA

were irrelevant. Its significance lay in the fact that there was now a legally mandated classification of rural society along such lines that gave formal weight and power to a traditional hierarchy in the Punjab village between cultivators and laborers [21]. The village record made it more difficult for individuals to escape from a marker of social status because the custodians of that record – virtually across the province – were representatives of the locally dominant agricultural caste. This was to have and, arguably, continues to have significant implications for the inclusion of the most marginalized segments of rural society in opportunities in agrifood systems.

AGRARIAN REFORMS AND THE GREEN REVOLUTION

Agrarian Reforms

A series of redistributive agrarian reforms were carried out in Pakistani Punjab between 1950 and 1977 [22]. In the period leading to the independence of Pakistan in 1947, the Muslim League, which was to emerge as the post-independence ruling party, established a committee to enquire into the conditions of the local agrarian society. The political context of this development was shaped by the broader debate on redistributive land reforms across India, active peasant mobilization in many parts of the British Indian empire, and the establishment of elected provincial governments under the Government of India Act of 1935. The political leadership, although drawn predominantly from the landlord class, began deliberating the issue, at least nominally, from the viewpoint of the welfare and rights of the rural poor. The first major agrarian reform was the Punjab Protection of Tenancy Act of

1950. This was followed by the imposition of a ceiling on the size of holdings and the redistribution of above-ceiling land by the government in 1959. Two further attempts were made at redistribution in 1972 and 1977 by lowering the land ceiling and closing various loopholes through which landowners had managed to evade the law. However, in 1989, the Supreme Court declared that the imposition of a land ceiling was in violation of Islamic injunctions and halted any further acquisition and redistribution of land through these laws [23].

Agrarian reform laws had two main objectives. The first was to provide security of possession to tenants. The Punjab Tenancy Act of 1887 set out a legal definition of occupancy tenants based on a proven history of possession. Other tenants were, therefore, to be treated as ‘tenants-at-will’ and could be ejected by landowners at any time. The Punjab Protection and Restoration of Tenancy Act of 1950 was aimed at securing the position of non-occupancy tenants. [24]

The second objective was to reduce the size of landholdings and oversee the transfer of surplus land to the landless or the land-poor. The first law for redistribution was promulgated through a martial law decree in 1959 following a military coup. This law was drafted by a Land Reforms Commission made up of technocrats and concurred with the recommendations from Pakistan’s First Five-Year Plan (1955–1960). An upper ceiling of 500 acres was set on the individual ownership of cultivable land, with various exceptions, and the government was to acquire and transfer the surplus area for redistribution.

The land ceiling was lowered further in two successive laws in 1972 and 1977. The primary beneficiaries of land redistribution were tenants who, as per the land revenue record, had cultivated that holding in the previous season. In case no tenant had been recorded as being in possession of the land at the time of its acquisition, it was to be distributed to other landless tenants or smallholders [25].

All the ceiling laws taken together led to the acquisition of 5.6 mac across the country; separate figures for Punjab or South Punjab are not available. Of this area, approximately 4.1 mac were redistributed to 269,000 beneficiaries [26].

The total area redistributed was under a tenth of the cropped area of the country. The number of beneficiaries represented fewer than 4% of all rural households at the time, most of whom were existing tenants. Occupancy tenants were already somewhat protected before the 1950 law, which extended some degree of protection to tenants-at-will. There were reports, however, that landowners colluded with land revenue officials to prevent the recording of tenancies that could have been protected by the 1950 law. This effectively made it difficult for many landless tenants to establish their credentials as potential beneficiaries of the land redistribution laws that were to come later.

The focus of agrarian reforms on tenants was in keeping with the political significance of cultivators. In Punjab, the idea could be traced back to the somewhat idealized view of nineteenth-century colonial officials on the village-based communities of self-cultivating peasants of central Punjab.

Landless tenant cultivators represented an anomaly in this idealized vision of rural society – an anomaly that could be removed through government action. The legal protection accorded to occupancy tenants in 1887 was an early step in this direction. Owner-cultivators and tenants each constituted around a fifth of all earners in Pakistani Punjab before independence. Over half the earners were not involved in cultivation, while 7% were engaged in cultivation as agricultural laborers or farm servants. A large proportion of those who reported various service occupations (pejoratively labeled *kammi*) as their primary activities were also, in effect, part-time agricultural laborers. It was not only the presence of a large number of landless tenants but the existence of an even larger number of landless agricultural laborers and farm servants, which was at odds with the idealized image of a village-based community of peasant cultivators.

The condition of this huge population, which was connected to the agrarian economy yet not counted as cultivators or peasants, did receive some recognition from the Muslim League committee:

"he is the menial of the landlord, and he has to often struggle against the oppression of the peasantry. Even the protection of elementary human and moral rights is frequently denied to him." (Naqvi et al 1987, 107)

When it came to policy action, however, the 1959 report of the Land Reform Commission demurred:

"We have not dealt with agricultural labour and the steps that should be taken for the amelioration of its condition. We do realise that this class of workers is almost entirely at the mercy of its employer [...]. This, however, is a problem which, to our mind,

is more akin to the conditions of labour generally. Sooner or later, it will be necessary to provide the agricultural labour some measure of security and protection, but the problems involved in devising such measures are so intricate that it would need far more time than we had at our disposal.” (Naqvi et al 1987, 215-216)

The situation of the poorest segment of the agricultural economy – viz., agricultural laborers and service providers – was not revisited by agricultural policy thereafter [27]. Agricultural laborers were virtually eliminated as stakeholders from discussions on agriculture and agrifood systems.

Agrarian reforms reduced the size of very large landholdings and eliminated differential grades of landed property, such as revenue-free jagirs. These reforms had a limited impact on land ownership inequalities and did not substantially address the condition of the rural landless poor. The ultimate beneficiaries were tenant farmers, particularly those who already had some rights of possession or tenure that were recognized in the village record. Many of them became self-cultivating owners. These reforms also accelerated the decline in tenancies, as farmers began resorting to hiring casual laborers or entering new forms of sharing or piece-rate contracts that were not officially recorded.

Green Revolution

‘Green revolution’ refers to the introduction of fertilizer-responsive grain varieties developed by publicly supported agricultural research centers in the Global South (Pray 1981). In Pakistan and across large parts of India, the period from the mid-1960s to the mid-1970s is referred to as the

Green Revolution period, when high-yielding varieties of wheat and rice were introduced through government-run agricultural extension services (Murgai et al. 2001).

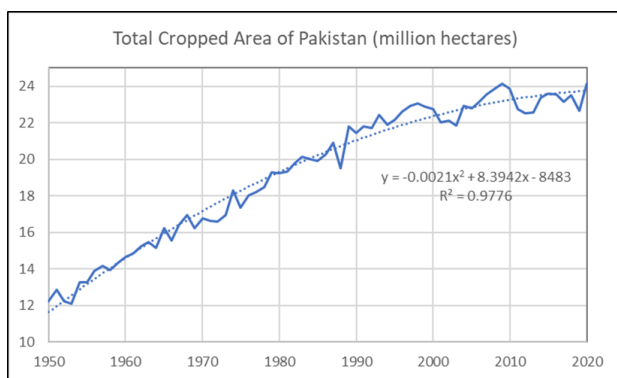
Debates about the green revolution in Pakistan mirrored those in other parts of Asia, where opinion was divided between those who saw exogenous technological change as a panacea for hunger and poverty and those who raised concerns about growing agrarian inequality due to the adoption of technologies that may have favored larger landholders (Pray 1981, Freebairn 1995, Alavi 1973). The political context probably played a big part in shaping these debates [28]. In Pakistan, where proponents of radical redistribution were disappointed in what was being regarded as meek land reforms, the possibility of rapid technological change allowed the government to shift attention away from class-based rural inequalities to a more benign vision of all rural classes gaining from the green revolution (Niazi 2004).

Statistical analyses of agricultural growth in Pakistan confirm that the green revolution was associated with significant improvements in agricultural productivity (Kurosaki 1999) through improvements in crop yields as well as a shift toward higher-yielding crops. Examination of agricultural trends from the 1960s to the 1990s shows that growth achieved from 1966 to 1974 was attributable to the adoption of new seed varieties, while the main driver of growth from 1975 to 1984 was the more intense application of other inputs such as fertilizers and pesticides.

The post-green revolution period from the mid-1980s saw growth due to rising total factor productivity (TFP) or the more efficient use of inputs (Murgai et al. 2001). In Pakistani Punjab, the cotton, wheat, and mungbean regions of South Punjab witnessed the highest rise in TFP.

The increase in cropped area due to the continued expansion of irrigated agriculture was a key factor in agricultural growth. The cropped area doubled between 1950 and the late 1990s, after which growth tapered off (Figure 6). After the growth potential of the new seeds and the intensification of associated inputs had been met by the 1980s, the main driver of growth in wheat cultivation was acreage rather than yield. The green revolution appeared to have stalled (Malik et al. 2016) [29].

FIGURE 6. Change in Total Cropped Area: 1949–1950 to 2019–2020



Sources: Author's compilation based on Federal Bureau of Statistics (1998); PBS (2011).

While the introduction of new seed varieties boosted the outputs of wheat and rice in Pakistan, the promotion of what was, de facto, a case of technology transfer, the green revolution, led to exaggerated expectations from supporters and detractors alike. What the green revolution demonstrated was that farmers in the irrigated plains of Pakistan – including subregions that

were generally considered to be under-developed, such as South Punjab and Sindh – were receptive to the application of new inputs. A longer view of the history of the region and its various subregions suggests that this was neither an anomaly nor a novel development. Agriculture in the irrigated plains, particularly in South Punjab and Sindh, had produced large surpluses for government revenue and markets in the precolonial period, and landlords and cultivators had a demonstrated record of entrepreneurship.

Similarly, the idea that the green revolution led to massive and adverse distributional changes in the rural economy needs to be seen from a longer historical perspective. Indeed, tenant farms and the area in use by landless tenants declined rapidly in the period coinciding with the green revolution, with a corresponding rise in owner self-cultivation (Niazi 2004). It had been predicted that the green revolution would favor bigger landowners, who had greater access to the capital required for adopting technological change, and that increased profitability of farming would lead to the eviction of tenants (Alavi 1973). However, there were other factors at play. Without adequate attention to pre-emptive action, tenancy protection laws would have led to the eviction of many tenants. Increasing demographic pressure on the land and the availability of labor-saving machines (tractors) would have increased the resumption of land for self-cultivation. The green revolution may have accelerated these trends.

While the adoption of fertilizer-responsive seed varieties was not a revolution in the sense of either a significant change in farmer behavior

or a boost to medium- or long-term sustained improvements in productivity, it did change the agrifood system in one crucial manner. The use of fertilizers and pesticides became integral to the farming of all major crops in the irrigated plains, so much so that the positive effect of the new high-yielding varieties of wheat was found to have been canceled out by issues connected with sub-optimal input usage and the resulting decline in soil and water quality (Byrelee and Siddiq 1994).

LESSONS FOR CHANGE FROM HISTORY

Contemporary Policy Thinking

The National Food Security Policy (MNFSR 2018) provides a framework for addressing food security through agricultural growth, which consists of the following four main areas of action: food availability (greater productivity and diversity in agricultural output), food accessibility (social protection measures as well as the regulation of markets), food utilization (measures for public health and food safety), and food stability (standard setting, climate resilience, and disaster responsiveness). There is an overlap between the food availability aspect of the national policy and the agriculture policies of the provinces [30].

Agricultural Growth

The main thrust of these recommendations is geared toward the existing conditions in the irrigated plains, which is the production of major crops under external economies of scale across farms of various sizes [31]. Many of the proposals in the national, Punjab, and Sindh policies relate to attempts at revitalizing or accelerating trends characterized by the green revolution through the development

and adoption of improved seeds and the optimal use of inputs such as fertilizers and pesticides.

The policy discussion is in line with the wide agreement in the academic literature that over the past few decades, some of the main drivers of agricultural growth in the Indus floodplains have already reached their limits [32]. It is no longer possible to expand the availability of irrigated land as the water budget constraint has been reached at the river system level. Fertilizer-responsive crop varieties are not able to boost agricultural output anymore, and studies suggest that the application of fertilizers and pesticides may have compromised soil quality to a great extent (Murgai et al. 2001). Historical data suggest that technological improvements – over and beyond the application of newly available inputs – have not been a significant factor in agricultural growth. There is also agreement that future growth can only be supported with a range of reforms that aim to conserve and improve water and soil resources, remove major policy-induced distortions affecting profitability and resource allocation in agriculture (e.g., relating to wheat procurement and sugarcane pricing), and focus on the development of value chains for higher-value agriculture outputs such as fruit, vegetables, and dairy (Spielman et al. 2017).

The National Food Security Policy also makes a range of recommendations on land and water resource management. The policy is premised on the recognition that existing water sources have reached their limit for exploitation; most of the proposed measures aim to conserve water resources. Radical proposals, such as a water policy with the possibility of

introducing prices or economically determined user charges, are included alongside relatively innocuous recommendations, such as “*facilitating provinces for strengthening extension services in water management,*” and wish-list statements, such as the need for “*sustainable intensification of crop and livestock systems, while conserving water resources and averting degradation of natural resources*” (National Food Security Policy 2014, 9).

Markets

The national policy and its provincial counterparts have a dual view of markets and their role in increasing agricultural growth and improving food security. While it is acknowledged that markets have a key part to play in “*the transfer of products from farms to consumers*” (National Food Security Policy 2014, 15), this role is seen to be compromised by poor standards, weak regulation, lack of market intelligence, and the absence of cold chains.

It is also concluded that

“smallholders are mostly isolated from markets and are dependent upon middlemen....and...are often exploited.” (National Food Security Policy 2014, 15). The policy proposes several technological and regulatory fixes to these perceived problems.

The Sindh policy develops a similar analysis with respect to credit: “[*credit*] *mainly comes from the middlemen who supply inputs....and also provide emergency loans and advances...In return the middleman is the main buyer of the farmers’ output, often charging large margins for his services.*” (GoS 2018, 5). This perspective is also present in the Balochistan policy draft and is remarkably similar to the view held in the Punjab policy:

“Farmers have to rely on the commission agent (arthi) not only to sell produce but

also for other critical services like borrowing money, market information, and input supplies etc. which puts the commission agent in a unique position of strength to the degree that it has started to exploit farmers and keeps the lion’s share in the margin.” (PAD 2018, 21).

The Punjab policy makes a strong pitch for improving market functioning through the reform and regulation of the *mandis* (recognized marketplaces). Other provinces also appear to share the optimism that markets can be made more efficient and equitable through various policy interventions. However, the idea that commission agents, *arthi*, middlemen, and other market players have established exploitative monopolistic relations with uninformed farmers, particularly smallholders, is reminiscent of the themes developed under British colonial rule concerning peasants and moneylenders.

Gaps

Although the national policy accepts the improvement of food security and nutrition as its major challenge, the analysis underlying its various proposals does not include an explicit examination of who the food insecure are, what might be the drivers of their food insecurity, or what might be the possible pathways and disconnects between agriculture and food security. Provincial and draft policies appear to take their lead from the national document – they, too, include scant analysis of the social, economic, geospatial, or regional correlates of individual and household food insecurity and assume that there is a linear and positive relationship between agricultural productivity growth and food security.

While the national and provincial policies signal concern over the exploitation of farmers at the hands of middlemen, the situation of landless tenants, laborers, and women agricultural workers does not receive much attention. The Sindh policy does mention that the government will take measures to enhance the productive assets *“of the rural poor, such as small sharecroppers, cattle farmers, the landless, transhumant, small-scale fishers, and women-headed household.”* These measures include proposed special programs for resource-poor (presumably non-irrigated) areas and training programs for women and the youth. Punjab identifies three population segments as primary beneficiaries: small farmers (3 to 7.5 acres of landholdings), rural women, and rural youth. It is implied that the main vehicles for agricultural growth-oriented measures will be commercial farmers.

For women and the youth, the main proposed interventions include various types of training.

The Bigger Picture

This paper shows that the current policy framework on agriculture and food security in Pakistan is based largely on the analysis of the drivers of and impediments to agricultural growth. The relationship between agrifood systems and agricultural growth and food security outcomes for diverse, vulnerable populations remains relatively unexamined. It is perceived that achieving higher rates of agricultural growth is necessary, and perhaps sufficient, to improve food security. The historical context of the sector, particularly the differences between major agricultural regions and subregions, has not received due consideration. Moreover, it is assumed

that existing pockets of hunger and poverty are mostly restricted to subregions outside relatively well-endowed Indus-irrigated plains [33]. The study of South Punjab and Sindh shows that high agricultural productivity is not a sufficient condition for eradicating rural hunger, while that of Khyber Pakhtunkhwa (and northwestern Punjab) suggests that it may not be a necessary condition either.

Overlooking the historical regional perspective – let alone the disconnect between agriculture and food security at the individual and household levels – has two significant implications. One, policy discussions on agrifood systems remain disengaged from ideas that may lead to more inclusive growth and growth that has a greater impact on hunger and poverty. Two, the opportunity for formulating and implementing locally relevant policies and strategies, which has opened up in the last decade or so through the devolution of powers to the provinces, remains largely unutilized.

While an analysis of growth trends effectively identifies proximate drivers and impediments to growth within a relatively self-contained agrifood system – for example, by decomposing growth into its various sources – it is not always adept at accounting for factors that shape agrifood systems over time and space. The existence of the canal-irrigated agrifood system, for example, is an outcome of institutional, technological, and investment decisions at particular places and at particular moments in time. There is nothing immutable about all the features of this system, even if some things are easier to change than others.

There is a need, therefore, to distinguish between the short-term drivers of growth and obstacles that hinder progress and underlying structural issues within agrifood systems that must be overhauled to address food security.

The failure to sufficiently discriminate between structural and proximate factors can lead to the proliferation of policy wish lists without a clear understanding of the most important strategic issues to address and the most challenging constraints to overcome. Insufficient discrimination between recommendations is perhaps a result of the weak ownership by agrifood system stakeholders. In the absence of active political engagement and critical feedback, it is easy (and lazy) to include all things that seem like good ideas. Stakeholders confronted with a menu of recommendations that is too large may have little incentive to engage with what appears to be a long wish list rather than actionable plans.

Turning Points and Continuity

The period from the 1840s to the 1980s marked several crucial turning points in the development of the agrifood systems of the irrigated plains across the Indus basin and its subregions, including South Punjab and Sindh. A historical perspective offers many insights into contemporary systems governing agrarian resources and their distribution. A historical view also explains the emergence and consolidation of particular classes and social groups as agrifood stakeholders and the corresponding exile of others from policy discussions. Besides, how agrifood systems have responded to exogenous events, constraints, and opportunities – such as the development of infrastructure, the availability of new technologies, and

the possibility of engaging with new markets – is instructive of factors that may help or hinder future change. This subsection offers observations with respect to agrifood systems of the irrigated Indus floodplains, in general, and South Punjab and Sindh, in particular, based on the preceding historical review.

The State, Politics, and Peripheries

From the 1840s onward, technical as well as institutional innovations in agrifood systems have been driven by factors that were external to stakeholders within the system. The government was the dominant player in this regard. This, of course, was neither unique to the Indus plains nor the historical period under review. In Punjab, government action was almost always foregrounded on the objective of maintaining political stability around an idealized picture of rural society, which explicitly or implicitly favored landowning castes of central Punjab at the expense of other segments of the population. In Sindh, by contrast, the colonial government vested its political capital with the class of *zamindars*, who were recognized as landowners. The government did not set itself the task of recognizing and addressing innovation needs in agrifood systems or pursuing broader goals such as food security for the population. Rather, it prefaced its actions by referring to the danger of political instability and the loss of political support among the subregions and classes that were recognized as being of strategic value. The stakeholders were expected to act as passive recipients – or beneficiaries in some cases – and not as active innovators or demanders of innovation. This pattern carried over to the period after independence through the green revolution and beyond.

While agrifood system stakeholders across the floodplains played a marginal role in driving technical and institutional change, those in regions such as South Punjab and Sindh were even more peripheral. The social organization of South Punjab, for example, was as far removed from the ideal village-based community of cultivators envisioned for central Punjab as that of Sindh was from the *ryotwari* heartlands of the Bombay Presidency. The two very different land revenue settlements had similar effects in these regions – the consolidation of the power of overlords, tribal chiefs, and spiritual leaders as monopolistic landowners. To the extent that the government justified or facilitated innovation with an eye on securing political stability, its relatively narrow focus on particular regions and classes often bred other sources of political disaffection that required attention. The state's positioning of itself as a protector of its favored agrarian classes, for example, led to the emergence of conflict rather than cooperation between farmers and merchants.

The assumption that the central Punjab districts were potential models of social progress under colonial rule triggered conflicts between migrants from that subregion and host communities in the canal-irrigated subregions.

Recognizing rather than ignoring the historic role of the colonial government in agrifood innovations – and the role, in turn, of political imperatives in shaping government action – can lead to greater openness in establishing the legitimacy of demand-making by new stakeholders from the periphery. agrifood stakeholders in these peripheral regions, such as South Punjab, have already demonstrated an

ability to adapt to technological and institutional innovation to maintain competitive advantage. The progressive devolution of powers to the provinces and the partial acceptance of the demand for devolved authority within Punjab to South Punjab are developments that signal opportunities for the role of government at the subregional level. A regional development agenda will allow for a cross-sectoral focus and go beyond the narrowly defined mandate of a national or provincial agricultural ministry or extension services to include a range of measures leading to more sustainable agrifood systems.

Missing Stakeholders

Colonial land revenue settlement systems transformed existing locally dominant castes of landlords and farmers into a class of landowners and triggered a process that dispossessed a wide range of rural classes, including artisans, service workers, farm servants, laborers, pastoralists, and those dependent on common property resources, from entitlement to land. In Punjab, the Punjab Land Alienation Act created a formal caste-based distinction between agricultural and non-agricultural tribes, which could be monitored and enforced using the village-based land revenue system. Agrarian reforms focused on tenants, mostly from agricultural tribes, ignored service workers and laborers, and further entrenched the position of existing cultivators at the expense of those who were classified as non-cultivators and non-agricultural. Despite the declared aims of these measures to protect and entitle landless tenants, access to land through tenancy declined rapidly, and tenants were reduced to the status of agricultural laborers.

Many rural households continue to remain without access to agricultural land either as owners or tenants and are not recognized in state policy as legitimate actual or potential stakeholders in agrifood systems, even if they provide much of the labor and rely on the sector for their livelihoods. Class differentiation and the evolution of propertied interests and their political protection had a distinctive dynamic in South Punjab. Unlike central Punjab, where village ownership was vested jointly among cultivator caste families, in South Punjab, it was the tribal chiefs and spiritual leaders who were recognized as owners, while actual cultivators were relegated to the position of landless tenants. This was similar to what happened in Sindh, where property rights to land were vested in individuals with political influence or those who had occupied a strategic position in the development and management of precolonial irrigation systems. However, the consequences of the village-based settlement system, followed by the enforcement of PALA in Punjab, meant that a further layer of hierarchy was formalized with respect to the class of rural landless people who were deemed to be from non-agricultural tribes.

The historical review also amplifies how, stage-wise, landless agricultural laborers in agrifood systems lost their position as stakeholders. From land revenue settlements, through PALA and canal colonization, to post-independence agrarian reforms and the green revolution, the visibility of those who undertake the bulk of essential work in agriculture has diminished. They continue to show up in statistical exercises such as labor force surveys but are absent from most

sector analyses and policy discussions. The persistence of deep subregional pockets of hunger and poverty, including in high-performing agricultural regions, is one consequence of this invisibility. This is a major disconnect between agricultural growth and food security that must be addressed through explicit attention to the situation of women and men who work in agriculture but are not recognized as farmers.

An explicit focus on the drivers of rural hunger and poverty will require, among other things, the reinstatement of the identity and interests of agrifood stakeholders who have been progressively marginalized from the mainstream policy discussion. This suggests the need for attention on landless agricultural laborers, casual workers, seasonal migrants, as well as landless tenants across the Indus-irrigated plains. In Punjab, it also means the withdrawal of, or at least a debate about the withdrawal of, formal sanctions from traditional sources of social hierarchy, such as the legal distinction between 'agricultural' and 'non-agricultural' tribes. Other key stakeholders who have always remained invisible, such as women agricultural workers, whether they supply their labor in the context of family units or outside, must be recognized. It is time that the promise made by the Land Reform Commission of 1959 that "sooner or later" the conditions of agricultural laborers will need to be addressed, is finally redeemed in full for women and men.

Land and Water

The integrated canal irrigation system led to a major transformation of not just water management and usage in the Indus floodplains but the entire agrifood system. The canal system developed in the 1880s under British colonial rule replaced the local seasonal irrigation works with an integrated perennial system. The traditional irrigation system was based on partnerships between landlords – who were generally tribal chiefs, cultivators, and merchants who invested capital – and the state. In contrast, the colonial canal system was built and managed exclusively by the government through administrative mechanisms, at least nominally. The entrepreneurial capacity of powerful landlords was redeployed to capture rents by influencing the local management of the canal system. The expansion of irrigated areas through the canal systems began to taper off in the 1990s as existing water resources were reaching exhaustion. As water budget constraints were reached, the scarcity of irrigated water increased the premium on private investments in accessing groundwater where suitable, as well as on the ability to secure favorable allocations from the public canal system.

While the integrated system enabled farmers to benefit from economies of scale with respect to irrigation, it also implied that the entire command areas of canals and water courses became unified cropping zones with limited autonomy for smaller farmers regarding crop choice and other farming practices. Innovations requiring changes in farmer behavior, therefore, pose significant collective action challenges, with the government and large landowners occupying a strategic position for effecting change.

National and provincial policy documents recognize the need for reforms in land and water resources management. The canal irrigation system experienced a steady expansion in cropped areas through the conversion of so-called wasteland into cultivable land and multiple cropping seasons for a period spanning over a century. There is widespread agreement among analysts and policymakers alike, however, that the country has reached the limits of its water budget constraint. Besides, there is a recognition that there are serious political constraints – at the national, subnational, and local levels – in agreeing to and implementing the much-needed reforms for the sustainability of land and water resources.

The historical review reveals that the development of the canal irrigation system involved the introduction of technology and infrastructure (in the form of civil engineering works on rivers and canals) but was also based on institutional changes with respect to land and water resources. The government's assumption of all responsibility for the development and management of canals – in the place of precolonial partnerships between the state, *zamindars*, cultivators, and merchants – converted a system of joint production into one of rent appropriation. Another institutional supposition underlying the new canal system was the implied notion that there were virtually unlimited river flows to draw upon. There was little consideration of the economic cost of water, even as water flows to pre-existing irrigation works were affected; the acknowledgment that water resources were not unlimited was piecemeal.

The historical view also suggests that institutional and political economy issues with respect to the management of land and water resources are integral rather than incidental to the technology of the canal irrigation system. Technological and civil engineering solutions – such as greater storage capacity or the lining of canals and water courses – cannot be expected to lead to sustainable outcomes on their own. An agenda for reform must be premised on a broader agreement on the ecological and economic sustainability of the river and agrifood systems.

Competitiveness and Markets

The history of the Indus plains agrifood system is one of quick adaptation to technological and institutional innovation. Markets began to play a key role in its agricultural economy early on. Not only are the main staple crops widely traded, but specialized cash crops, such as cotton and sugarcane, dominate the farm economy in particular regions. The adoption of fertilizer-responsive crop varieties that began through the green revolution in the 1960s led to the emergence of agrifood systems that are dependent on industrially produced inputs (fertilizers and pesticides). Even if agricultural growth has slowed down, there are concerns over yields being lower than those achieved in comparable countries, irrigated-plains agriculture in Pakistan remains globally competitive. Two of the main cash crops – rice and cotton – are exported worldwide, as are fruits such as mangoes and oranges. Wheat acreage is responsive to government-controlled procurement prices, and these, too, are generally set to correspond with the expected world market price. Sugarcane is the only

significant crop that benefits from non-competitive pricing.

The competitiveness of irrigated floodplain agriculture has been premised, in large measure, on the capacity of informal institutional arrangements in agriculture to adapt to externally driven changes and innovations. The introduction of tractors in the 1960s, for example, led to the creation of flexible rental markets, which allowed smaller farms to deploy farm machinery. This institutional adaptation belied the expectation that mechanization would increase productivity on large farms compared to small ones. Much of the adaptability, however, related to new forms of informal labor, piece rate, and tenancy contracts, which bypassed formal regulation and held down labor costs. The use of women workers for much of the harvesting work in cash crops such as cotton and vegetables, for example, exploits the substantial wage gap between women and men. The availability of low-wage workers is, in turn, premised on a combination of public investment choices and social structures that limit the availability of alternative economic opportunities for landless poor men and particularly women.

The coexistence of competitive agrifood systems and the enduring success of non-food cash crops in the subregions of the Indus floodplains, such as South Punjab and Sindh, which have high rates of rural hunger and poverty, may not be anomalous. There might be common historical drivers behind agricultural productivity and rural deprivation in these subregions. The economies of scale inherent in the development of irrigation systems in these regions were realized in the

precolonial period through partnerships between politically influential individuals (chiefs, overlords, and spiritual leaders), cultivators, and urban merchants and overseen by the government.

Colonial land revenue settlements vested land ownership with the overlords, and public investment in integrated irrigation systems allowed them to acquire a strategic position within the agrifood system with respect to water management, crop choice, technology adoption, and labor arrangements. The fact that these regions were on the political periphery of the colonial state meant that propertied classes, as well as their landless clients, had few economic opportunities outside of agriculture.

Contemporary policy frameworks have adopted a dual attitude toward markets. While the role of markets is seen as critical to drive growth and achieve other policy goals, little attention has been paid to how markets function within the agrifood system. There is scant recognition of the competitiveness of the existing agrifood system. Neither is there an awareness of the possibility that this competitiveness might be due, in part, to exploitative labor arrangements. At the same time, it is widely assumed that traders and other market intermediaries enjoy exploitative monopolistic relations with farmers.

The invisibility of exploitative labor relations on farms, as well as the unsubstantiated presumption of farmer exploitation at the hands of middlemen, are parts of the trope of the simpleminded and industrious peasant imagined by colonial administrators in mid-nineteenth

century Punjab. Realistic policy and institutional changes in the agrifood system for sustainable growth and hunger and poverty eradication will require an examination of competitiveness and markets in agriculture that are not colored by the political preferences of the past.

END NOTES

1. According to the Pakistan Bureau of Statistics (PBS) 2020, in rural areas agriculture, forestry and fishing account for 52% of the output of all employed persons aged 10 and above – the figure for male workers is 42%, while for female workers it is 78%.

2. Calculated from data published by the Finance Division (2022).

3. 'Underperformance' or 'performing below potential' is a consistent theme in sector analyses in key policy documents, including the National Food Security Policy (MNFSR 2018) as well as provincial and draft policies (See, Rana et al. 2021 for Balochistan; Miller et al. 2021 for Khyber Pakhtunkhwa; Secretary Agriculture, Government of Punjab 2018 for Punjab; GoS 2018 for Sindh).

4. Agriculture, land administration, irrigation, produce markets, crop procurement and other issues relating to agrifood systems were already with the domain of responsibility of the provinces before the 18th constitutional amendment. However, in practice, provinces looked to the federal government for direction. The constitutional change has placed the provinces in the driving seat, restricting the federal government's role to that of coordination.

5. Punjab and Sindh have adopted their respective provincial agriculture policies (Secretary Agriculture, Government of Punjab 2018; GoS 2018). The Balochistan provincial government collaborated with the International Food Policy Research Institute (IFPRI) to prepare its agriculture policy (Rana et al. 2021), while the government of Khyber Pakhtunkhwa received support from the Food and Agriculture Organization (FAO) to preparation a policy paper on climate-smart agriculture (Miller et al. 2021).

6. Two other regions – Gilgit-Baltistan and Azad Jammu and Kashmir – are effectively parts of Pakistan but remain outside its formal constitutional set-up pending final resolution of the political status of the former princely state of Jammu and Kashmir.

7. South Punjab comprises the districts of Multan, Vehari, Lodhran and Khanewal of the Multan Division, the Bahawalpur, Bahawalnagar and Rahimyar Khan districts of the Bahawalpur Division, and the Dera Ghazi Khan, Rajanpur, Muzaffargarh, and Layyah districts of the Dera Ghazi Khan Division.

8. The use of tube wells is possible across large parts of Punjab due to the replenishment of the aquifer by the canal system. Sindh's near-total reliance on canal irrigation is due, in part, to the salinity of its groundwater.

9. This figure includes the four provinces and the Islamabad Capital Territory. It also includes Gilgit-Baltistan and Azad Jammu and Kashmir.

10. The Multidimensional Poverty Index (MPI) is based on well-being indicators measuring education, health, and household living conditions. There is no overlap between these variables and the Food Insecurity Experience Scale (FIES). The MPI is weighted on dimensions of well-being that may be supported through public services (education and health), whereas the FIES is driven largely by household and private income and consumption.

11. The expansion of British political control over present-day Balochistan and the southern part of present-day Khyber Pakhtunkhwa was labelled the 'forward policy,' which was initiated by colonial officers stationed in Dera Ghazi Khan (Bruce 1900).

12. Baden-Powell (1892) provides a detailed compendium of the land systems of British India and the historical antecedents of these systems.

13. The discussion on the development of canal irrigation in colonial Punjab draws heavily upon the work of Imran Ali (Kerr, 1989).

14. Several arrangements were explored for harnessing river flows for irrigation in the Indus plains. In some districts of western Punjab, e.g., Shahpur, private canals were maintained by large *zamindars* who were seen as water lords (Kerr 1989). In Multan and Dera Ghazi Khan, the government, tribal chiefs, and urban merchants were engaged in cooperative partnerships (Roseberry III 1988; Gilmartin 2015). The areas on the right bank of the Sutlej in South Punjab were irrigated by systems of inundation canals that were managed by an aristocracy that was a part of the state structure and overseen by the state (Bahawalpur Gazette 1904). In Sindh, there was evidence of the government's partnership with tribal chiefs to expand irrigated areas (Baden-Powell 1892).

15. The Punjab model, which essentially transposed the idealized peasant village onto a well-planned canal colony, was extended to Sindh early in the Jamrao tract, wherein significant new land allotments were made to migrants from the central Punjab districts (Haines 2011).

16. Contemporary accounts by colonial officials of agricultural practices make much of caste- and region-based differences in the skill and industry of farmers (see, Darling 1925). The choice of land grantees, however, was only partly driven by these impressionistic judgments.

17. As a result, significant and increasing areas of land in canal colonies had to be set aside as compensation to those whose lands had been damaged due to the

canal system – something that had not been anticipated during the designing of the canal system.

18. Government of Sindh. (n.d).

19. In this context, alienation refers to the transfer of land from an incumbent holder to another person.

20. Sales to urban moneylenders were characterized as land "lost" (Gandhi 2013, 261). In fact, little evidence exists that urban moneylenders were interested in or capable of operating landholdings without support from existing farmers.

21. One example of the crossover of the hierarchy formalized by PALA was in the definition of the term '*zamindar*' for the purposes of class-based quotas proposed in 1919 for public employment. The provincial government initially included all hereditary proprietors of agricultural land as potential beneficiaries regardless of tribe. Arguments by representatives of designated 'agricultural' tribes eventually prevailed to limit the beneficiaries of that policy to designated castes (Gilmartin 1988).

22. See Naqvi et al. (1987) for a useful compilation and review of policy documents.

23. The ruling did not have retrospective application; land already acquired and redistributed was not to be restored.

24. See Pakistan (1950).

25. See, for example, Paragraph 18 of the Land Reforms Regulation 1972.

26. By comparison, the total area of land 'abandoned' by Hindus and Sikhs who emigrated to India was estimated to be around 9.4 mac.

27. There was a reference to these workers with respect to rural housing in the 1970s when the government attempted to provide homestead land (Gazdar and Mallah 2012).

28. The main sponsors of the green revolution were the United States Agency for International Development (USAID) and other major US foundations (Pray 1981). The fact that these agencies were closely associated with the US government's Cold War policies in the region helped to set the tone for the policy debate.

29. In contrast, growth in the output of rice and maize continued to be driven by improvements in yield (Malik et al. 2016). The same was true of cotton, which had the fastest growth in yield in Pakistani Punjab after the mid-1980s (Murgai et al. 2001).

30. See GoS 2018, Secretary Agriculture, Government of Punjab 2018, Miller et al. 2021, and Rana et al. 2021 for Sindh, Punjab, Khyber Pakhtunkhwa, and Balochistan, respectively.

31. The proposed policies for Balochistan and Khyber Pakhtunkhwa – the two provinces with a marginal share of the Indus-irrigated plains – have some promising ideas that address local conditions. In Balochistan, for example, there is a recognition of the importance of leveraging ecological diversity to develop high-value products for the market. For Khyber Pakhtunkhwa, this diversity is recognized in the recommendation to create distinctive zones for promoting specific products and their value chains. Another useful perspective from Balochistan, also reflected in the national policy, is the need for a legal framework for groundwater resource use.

32. Spielman et al. 2017, for example, includes comprehensive analyses on a range of issues with respect to agriculture and food security.

33. The discussion about enhancing the assets of the rural poor in the Sindh policy, for example, recommends special initiatives for resource-poor subregions.

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